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GROUP 1700

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF:

:

Teruzi YAMAZAKI et al

: GROUP: 1725

SERIAL NO.: 09/961,094

: EXAMINER: C. Cooke

FILED: September 24, 2001

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FOR: SLURRY FOR CARRYING ZEOLITE AND  
METHOD FOR MANUFACTURING ZEOLITE-  
CARRYING ADSORPTION ELEMENT

**DECLARATION 37 CFR 1.132**

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

Now comes Teruzi Yamazaki who deposes and says that:

- 1) I am one of the inventors of the above-identified application.
- 2) I am employed by Nichias Co. Ltd in the Tsurumi Research Laboratory.
- 3) I have read the specification of the present application.
- 4) I have read the outstanding Office Action of the application and each of the references cited and applied therein.
- 5) That in order to demonstrate the superior characteristics of the claimed slurry of the invention including, in particular, the stable pH and viscosity characteristics over an embodiment of the slurry of the Lachman patent containing a polystyrene binder, the following comparative experiments have been prepared.

### Organic Emulsion Binders

Organic emulsion binder G: A polystyrene-polymer resin (solids component of the resin: 50 wt %, manufactured by A & M Corporation)

Organic emulsion binder C: Vinyl acetate resin (solids component of the resin: 60 wt %)

Organic emulsion binder D: (Meth)acrylic-styrene copolymer resin (solids component of the resin: 50 wt %)

Organic emulsion binder E: Styrene-butadiene copolymer resin (solids component of the resin: 50 wt %)

Organic emulsion binder F: Ethylene-vinyl acetate copolymer resin (solids component of the resin: 60 wt %)

Silica sol A: Stabilizer NH<sub>4</sub><sup>+</sup> (Solids component 30 wt %)

Silica sol B: Stabilizer Na<sup>+</sup> (Solids component 30 wt %)

### Comparative Experiment

A waveform article with a wave height of 1.9 mm and a wave pitch of 3.3 mm was formed from a substrate paper consisting of paper made of inorganic fiber (thickness 0.2 mm, voids 90 %) and an organic binder. A honeycomb carrier was obtained by winding the waveform article.

A slurry G was prepared by homogeneously dispersing 100 parts by weight of hydrophobic zeolite 5Na<sub>2</sub>O·Al<sub>2</sub>O<sub>3</sub>·5SiO<sub>2</sub>·9H<sub>2</sub>O (SiO<sub>2</sub>/Al<sub>2</sub>O<sub>3</sub> molar ratio = 4.8), 20 parts by weight of organic emulsion binder G, and 155 parts by weight of ion exchanged water. The pH of the slurry after preparation was 6.8 and the viscosity at 20° C was 18.6 mPa·s. The composition of slurry G is shown in Table 1, and the pH and viscosity at 20° C after preparation are shown in Table 3 below.

The prepared honey-comb carrier was dipped into slurry G for 10 minutes and dried for 60 minutes at 130° C. The honey-comb carrier was then dipped into silica sol B for 10 minutes and dried for 60 minutes at 130° C to improve the hardness of the honey-comb carrier and to ensure firm attachment of the zeolite. The resulting honeycomb carrier was fired for 60 minutes at 500 ° C to remove organic substances, thereby preparing a VOC (volatile organic compound) concentrate rotor of the adsorption element. The amount of zeolite attached to the adsorption element is shown in Table 2.

#### Experiment 1

A VOC concentrate rotor was prepared in the same manner as described in the Comparative Experiment except that slurry C was employed instead of slurry G and by using silica sol A instead of silica sol B. The composition of slurry C is shown in Table 1.

#### Experiment 2

A VOC concentrate rotor was prepared in the same manner as described in the Comparative Experiment except that slurry D was employed instead of slurry G and by using silica sol A instead of silica sol B. The composition of slurry D is shown in Table 1.

#### Experiment 3

A VOC concentrate rotor was prepared in the same manner as described in the Comparative Experiment except that slurry E was employed instead of slurry G and by using silica sol A instead of silica sol B. The composition of slurry E is shown in Table 1.

#### Experiment 4

A VOC concentrate rotor was prepared in the same manner as described in the Comparative Experiment except that slurry F was employed instead of slurry G and by using silica sol A instead of silica sol B. The composition of slurry F is shown in Table 1.

Table 1

|                           | Comp Exp | Exp 1 | Exp 2 | Exp 3 | Exp 4 |
|---------------------------|----------|-------|-------|-------|-------|
| Hydrophobic zeolite       | 100      | 100   | 100   | 100   | 100   |
| Organic Emulsion binder G | 20       |       |       |       |       |
| Organic Emulsion binder C |          | 18    |       |       |       |
| Organic Emulsion binder D |          |       | 20    |       |       |
| Organic Emulsion binder E |          |       |       | 20    |       |
| Organic Emulsion binder F |          |       |       |       | 18    |
| Ion exchanged water       | 155      | 165   | 155   | 155   | 165   |
| Total (parts by weight)   | 275      | 283   | 275   | 275   | 283   |
| Zeolite content (wt %)    | 36       | 35    | 36    | 36    | 35    |
| Slurry                    | G        | C     | D     | E     | F     |

Contents of hydrophobic zeolite, organic emulsion binders and water are given in parts by weight

Table 2

|   | Comp Exp | Exp 1 | Exp 2 | Exp 3 | Exp 4 |
|---|----------|-------|-------|-------|-------|
| Slurry  | G        | C     | D     | E     | F     |
| Amount of zeolite attached (kg/m <sup>3</sup> ) | 65.8     | 67.9  | 65.6  | 70.1  | 62.4  |
| After first dipping                             | 65.8     | 67.9  | 65.6  | 70.1  | 62.4  |
| After second dipping                            | *1       | *1    | *1    | *1    | *1    |
| Total zeolite attached                          | 65.8     | 67.9  | 65.6  | 70.1  | 62.4  |

\*1 Dipping of the carrier the second time or subsequent times was omitted because the required amount of zeolite for the adsorption element (60 kg/m<sup>3</sup>) had been achieved.

Table 3

|  | Comp Exp | Exp 1 | Exp 2 | Exp 3 | Exp 4 |
|--|----------|-------|-------|-------|-------|
|  | G        | C     | D     | E     | F     |
| pH<br>Immediately after preparation        | 6.8      | 5.8   | 5.1   | 4.8   | 5.9   |
| One month after preparation                | 6.4      | 5.9   | 5.2   | 5.0   | 5.9   |
| Three months after preparation             | 5.9      | 6.0   | 5.5   | 5.0   | 6.0   |
| Viscosity<br>Immediately after preparation | 18.6     | 15.8  | 16.2  | 17.1  | 18.7  |
| One month after preparation                | 19.9     | 16.0  | 16.4  | 17.5  | 18.7  |
| Three months after preparation             | 20.3     | 16.0  | 16.5  | 17.5  | 18.7  |

6) The results in the tables above, particularly Table 3 show that when slurry G is employed, which is consistent with the disclosure of the slurry in the Lachman patent, because of the increases in slurry viscosity, the manufacture of articles is difficult because of increased problems of attachment of zeolite to a carrier. Further, slurry G has a greater pH than slurries C to F of Experiments 1-4. Accordingly, the zeolites of slurry G collapses more easily than that of slurries C to F. The results obtained are of commercial significance.

7) The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

8) Further, deponent saith not.

Date: 16. July. 2003

Teruze Yamazaki